**Remarks**

Claims 1-13 are pending in the application. Claims 1-13 are rejected. All rejections and objections are respectfully traversed. Claim 9 is canceled.

Claimed is a computer implemented method for improving a solution to a combinatorial optimization problem. A priority algorithm in a form of an ordering function is applied to an instance of the combinatorial optimization problem to produce an initial solution including an ordering of the elements. The ordering of the elements is then modified to produce a re-ordering of the elements, and a placement function is applied to map values to the corresponding elements of the re-ordering. The modifying and applying are repeated until all elements have been placed to obtain an improved solution of the combinatorial optimization problem.

Claims 1-13 are rejected under 35 U.S.C. 101 as being directed to non-statutory subject matter.

Operations research uses scientific methods to solve complex, real-world problems that are concerned with the coordination and execution of the operations within real-world applications. The nature of the application, for the purpose of the claims, is essentially immaterial. Applicants assert that the optimization of the operation of the application or organization is a tangible result.

In operations research, "a combinatorial optimization problem" is a term of art. "Combinatorial optimization problems" generally means the class of real-world applications that are extremely difficult to solve (NP hard). The use of the term "combinatorial optimization problem" as claimed is conventional, and specifically means a class of real-world applications that can include, e.g., delivery truck problems, transportation scheduling problems, job shop scheduling problems, class and student scheduling problems, utility management problems, load balancing problems in power and communications networks, cell tower placement problems, and packing or lay-out problems, see paragraph [03].

Therefore, when the Applicants claim a method for improving a solution to a combinatorial optimization problem, the Applicants claim, nonexclusively, any or all of the above real-world applications. An initial "solution" or operation can be a "best route" obtained by conventional means, such as an ordering function. From there, the claimed steps improve upon that solution (operation) for the combinatorial optimization problem (difficult real-world application).

An improved solution to a combinatorial optimization problem, as claimed, is clearly a tangible and advantageous result for the application. Use of the claimed method results in optimized operations in many real-world applications, and is therefore statutory subject matter under 35 U.S.C. 101.

Claim 8 is amended to clarify that the computer program that performs the claimed method is stored on a computer.

Claims 1, 3, 6, 8, 9 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over AAPA in view of Beygelzimer et al., U.S. Patent Application Publication No. 2002/0161736 (Beygelzimer).

Regarding claims 1 and 8, Beygelzimer fails to teach the claimed modifying the ordering of the elements to produce a re-ordering of the elements.

The Examiner points to paragraphs [0037] and [0064]-[0066] of Beygelzimer as teaching the claimed modifying. However, those paragraphs only teach the ordering of elements in a coarsest graph and propagation of that ordering back to an original graph resolution. There is no re-ordering of elements of an initial solution to a combinatorial optimization problem in Beygelzimer.

Beygelzimer handles large data sets by modeling the data as a heterogeneous graph and merging vertices of the graph that have similar local structure until the amount of data to be examined is more manageable, see paragraph [0058]. At the coarsest resolution (smallest number of vertices), the nodes are ordered. This ordering, in an *unmodified* form, is propagated back to the original resolution by expanding the coarse data back to the original data. The propagation merely unmerges the previously merged data while *maintaining the ordering* determined at the coarsest resolution, see paragraph [0070]. Beygelzimer specifically states this at paragraph [0069]:

> **[0069]** Once the order of nodes in the coarsest graph is constructed by the spectral algorithm described above, the order is propagated back to the original graph through the sequence of intermediate graphs. In general, the order of the next level finer graph has to respect the order of the coarser graph. Since the vertices of the coarser graph are just multi-vertices of the next level finer graph, projecting one level back simply reduces to ordering the vertices within each multi-vertex.

It is clear that Beygelzimer fails to teach modifying the ordering of the elements of a solution to produce a re-ordering of the elements. The combination of AAPA and Beygelzimer cannot make the claimed invention obvious.

In addition, as Beygelzimer fails to teach modifying the ordering of elements, he also fails to teach repeating the modifying and the applying until all elements have been placed to obtain an improved solution of the combinatorial optimization problem. The combination of AAPA and Beygelzimer cannot make the claimed invention obvious.

The disclosures of Angelopoulos, Krishnan and Lesh all fail to cure the defects of the combination of AAPA and Beygelzimer. According to the above discussion, the remaining claims, which incorporate the limitations of claim 1, cannot be made obvious by the combination of AAPA, Beygelzimer, Angelopoulos, Krishnan or Lesh.

It is believed that this application is now in condition for allowance. A notice to this effect is respectfully requested. Should further questions arise

concerning this application, the Examiner is invited to call Applicants' agent at the number listed below. Please charge any shortage in fees due in connection with the filing of this paper to Deposit Account 50-0749.

Respectfully submitted,
Mitsubishi Electric Research Laboratories, Inc.

By Clifton D. Mueller

Clifton D. Mueller
Agent for the Assignee
Reg. No. 57,836

201 Broadway, 8th Floor
Cambridge, MA 02139
Telephone: (617) 621-7517
Customer No. 022199